

CLAIMS

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14. (Previously Amended) A process for recovering metal values including tantalum metal values and niobium metal values from a source material comprising tantalum, niobium and uranium metal values, the process comprising:
 - digesting the source material in a sulfuric acid solution comprising:
 - sulfuric acid;
 - a reducing agent; and
 - an additive comprising carbon;
 - for a period of time sufficient to solubilize tantalum metal values and niobium metal values and form a digestion mixture comprising an aqueous phase comprising solubilized tantalum metal values and niobium metal values, and a solid phase comprising uranium metal values;
 - heating the digestion mixture for a period of time sufficient to attain a temperature of 75-95 °C; and
 - separating the resulting solution comprising tantalum metal values and niobium metal values from the remaining solids comprising uranium metal values.
15. (Original) The process of claim 14 wherein the sulfuric acid solution further comprises hydrofluoric acid.
16. (Original) The process of claim 14 wherein the reducing agent comprises iron, aluminum or mixtures thereof.
17. (Original) The process of claim 16 wherein the additive comprises activated carbon.
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19. (Amended) A The process of claim 18 for separating and recovering metal values from a digestion mixture of metal containing material, including metal values to

be recovered, tantalum and/or niobium metal values and one or more additional metal values, comprising:

digesting the metal containing material in a sulfuric acid solution comprising:
sulfuric acid;

a reducing agent to render at least one of the additional metal values
insoluble in the digestion mixture; and

a carbon source which differs from the reducing agent;
for a period of time sufficient to solubilize the metal values to be recovered and render at
least one of the additional metal values insoluble in the digestion mixture;

heating the digestion mixture for a period of time sufficient to attain a temperature
of 75-95° C; and

separating the resulting solution from the remaining solids;:-
wherein the sulfuric acid solution further comprises hydrofluoric acid as a source of fluoride ion.

20. A The process of claim 18 for separating and recovering metal values from a
digestion mixture of metal containing material, including metal values to be recovered,
tantalum and/or niobium metal values and one or more additional metal values,
comprising:

digesting the metal containing material in a sulfuric acid solution comprising:
sulfuric acid;

a reducing agent to render at least one of the additional metal values
insoluble in the digestion mixture; and

a carbon source which differs from the reducing agent;
for a period of time sufficient to solubilize the metal values to be recovered and render at
least one of the additional metal values insoluble in the digestion mixture;

heating the digestion mixture for a period of time sufficient to attain a temperature
of 75-95° C; and

separating the resulting solution from the remaining solids;
wherein the sulfuric acid solution comprises:

0.09 to 0.4 pounds of concentrated sulfuric acid per pound of metal containing material solids (dry basis);
0.01 to 0.03 pounds of a reducing agent per pound of metal containing material solids (dry basis);
0.01 to 0.03 pounds of a carbon source per pound of metal containing material solids (dry basis); and
sufficient water to make a solution of 5 to 15% sulfuric acid in water.

21. (Previously added) The process of claim 20 wherein the sulfuric acid solution further comprises: 0.05 to 0.2, pounds of at least 50% hydrofluoric acid (HF) as a source of fluoride ion.

22. (Previously added) The process of claim 20 wherein the sulfuric acid solution comprises:

0.33 pounds of concentrated sulfuric acid per pound of solids (dry basis);
0.02 pounds of a reducing agent per pound of solids (dry basis);
0.02 pounds of a carbon source per pound of solids (dry basis) and
sufficient water to make a solution of 11% in sulfuric acid.

23. (Previously added) The process of claim 22 wherein the sulfuric acid solution further comprises: 0.12 pounds per pound of solids (dry basis) and 70% hydrofluoric acid (HF) as a source of fluoride ion.

24. (Previously added) The process of claim 20 further comprising the step of cooling the heated digestion mixture and wherein:

the metal containing material is digested for at least 1 hour in the sulfuric acid solution;
the digestion mixture is heated to above 75° C, for at least 0.5 hour;
the resulting mixture is cooled to below 60° C;
and the resulting solution is separated by filtering.

25. (Previously added) The process of claim 21 further comprising the step of cooling the heated digestion mixture and wherein:

the metal containing material is digested for at least 1 hour in the sulfuric acid solution;

the digestion mixture is heated to above 75° C, for at least 0.5 hour;

the resulting mixture is cooled to below 60° C;

and the resulting solution is separated by filtering.

26. (Currently amended) A The process of claim 18 for separating and recovering metal values from a digestion mixture of metal containing material, including metal values to be recovered, tantalum and/or niobium metal values and one or more additional metal values, comprising:

digesting the metal containing material in a sulfuric acid solution comprising:

sulfuric acid;

a reducing agent to render at least one of the additional metal values insoluble in the digestion mixture; and

a carbon source which differs from the reducing agent;

for a period of time sufficient to solubilize the metal values to be recovered and render at least one of the additional metal values insoluble in the digestion mixture;

heating the digestion mixture for a period of time sufficient to attain a temperature of 75-95° C; and

separating the resulting solution from the remaining solids; further comprising the following steps after the separation step:

washing the separated undissolved solids with a volume of water equal to the volume of the resulting solution separated (the filtrate) and

recycling the wash water into the sulfuric acid solution utilized in the digestion step.

27. (Previously added) The process of claim 20 wherein the reducing agent is iron.

28. (Previously added) The process of claim 21 wherein the reducing agent is iron.

29. (Previously added) The process of claim 20 wherein the carbon source is activated carbon.

30. (Previously added) The process of claim 21 wherein the carbon source is activated carbon.